Data Evaluation Report on the Acute Toxicity of BAS 062 03 W to Terrestrial Vascular Plants: Vegetative Vigor

PMRA Submission Number {.....} **EPA MRID Number 467152-20**

Data Requirement:	PMRA Data Code:	9.8.4 (TGAI) or 9.8.6 (EP)
	EPA DP Barcode:	D325185
	OECD Data Point:	IIA 8.12 (TGAI) and IIIA 10.8.1.1 (EP)
	EPA Guideline:	850.4150

Test material: BAS 062 03 W **Purity:** 750 g/L; 765.8 g/l (measured)

Common name: Chlormequat Chloride
Chemical name: IUPAC: Not reported
CAS name: Not reported
CAS No.: Not reported
Synonyms: None reported

Primary Reviewer: Brian D. Kiernan
OPP/EFED/ERBIV

Date: 04/24/06 10/17/06

Reference/Submission No.: {.....}

Company Code	{.....}	[For PMRA]
Active Code	{.....}	[For PMRA]
Use Site Category:	{.....}	[For PMRA]
EPA PC Code	018101	

Date Evaluation Completed: {dd-mm-yyyy}

CITATION: Frank, Pia. 2001. BAS 062 03 W: A toxicity test to determine the effects of the test item on vegetative vigor of terrestrial plants. Study performed by Staatliche Lehr- und Forschungsanstalt für Landwirtschaft, Weinbau und Gartenbau (SLFA), Breitenweg 71, D-67435 Neustadt an der Weinstrasse. Study number 80035. Study sponsored by BASF Corporation, Agricultural Products Division, RTP, NC. Study completed on May 17, 2001.

DISCLAIMER: This document provides guidance for EPA and PMRA reviewers on how to complete a data evaluation record after reviewing a scientific study concerning the acute toxicity of a pesticide to terrestrial vascular plants. It is not intended to prescribe conditions to any external party for conducting this study nor to establish absolute criteria regarding the assessment of whether the study is scientifically sound and whether the study satisfies any applicable data requirements. Reviewers are expected to review and to determine for each study, on a case-by-case basis, whether it is scientifically sound and provides sufficient information to satisfy applicable data requirements. Studies that fail to meet any of the conditions may be accepted, if appropriate; similarly, studies that meet all of the conditions may be rejected, if appropriate. In sum, the reviewer is to take into account the totality of factors related to the test methodology and results in determining the acceptability of the study.

Data Evaluation Report on the Acute Toxicity of BAS 062 03 W to Terrestrial Vascular Plants: Vegetative Vigor

PMRA Submission Number {.....} **EPA MRID Number 467152-20**

EXECUTIVE SUMMARY:

The effect of BAS 062 03 W (formulation containing the active ingredient chlormequat chloride) on the vegetative vigor of monocot (oat, *Avena sativa* and onion, *Allium cepa*) and dicot (cabbage, *Brassica oleraceae*; carrot, *Daucus carota*; pea, *Pisum sativum* and sunflower, *Helianthus annus*) crops was studied at nominal application rates of 0 (negative control), 0.21, 0.41, 0.83, 1.7 and 3.3 lbs ai/A; measured application rates were 0 (negative control), 0.21, 0.42, 0.84, 1.7 and 3.4 lbs ai/A. The growth medium used in the test was a mixture of natural soil, natural topsoil and quartz sand. On day 21 the surviving plants per pot were recorded and cut at soil level for measuring the plant height and fresh weight.

In the vegetative vigor test, the plant fresh weight and plant height were affected by BAS 0620 03 W treatment. Fresh weight was affected in carrot and sunflower only, and plant height was only affected in carrot. No mortality occurred during the definitive test period. No monocot species exhibited any significant reductions in growth (EC_{25} of >3.4 lbs ai/A, NOAEC of 3.4 lbs ai/A). The most sensitive dicot species, based on fresh weight, was sunflower with an EC_{25} of 1.5 lbs ai/A and a NOAEC (and EC_{05}) of <0.21 lbs ai/A.

The following abnormalities were noted: chlorosis, leaf deformation and scorch in sunflower only. Phytotoxic effects were not observed in any other species.

Maximum Labeled Rate: Not reported

Results Synopsis

Monocot

EC_{05}/IC_{05}: >3.4 lbs ai/A 95% C.I.: N/A
EC_{25}/IC_{25}: >3.4 lbs ai/A 95% C.I.: N/A
EC_{50}/IC_{50}: >3.4 lbs ai/A 95% C.I.: N/A
NOAEC: 3.4 lbs ai/A
Slope: N/A
Std err: N/A
Most sensitive monocot: None
Most sensitive parameter: N/A

Dicot

EC_{05}/IC_{05}: <0.21 lbs ai/A
EC_{25}/IC_{25}: 1.5 lbs ai/A 95% C.I.: 0.20-11 lbs ai/A
EC_{50}/IC_{50}: >3.4 lbs ai/A 95% C.I.: N/A
NOAEC: <0.21 lbs ai/A
Slope: 0.243
Std err: 0.120
Most sensitive dicot: Sunflower
Most sensitive parameter: Fresh Weight

This toxicity study is classified as SUPPLEMENTARY but varies considerably from the guidelines for a Tier II Vegetative Vigor toxicity study. A NOAEC could not be identified for the most sensitive species, sunflower; inhibition of fresh weight for this species was 17% at the lowest treatment level.

Data Evaluation Report on the Acute Toxicity of BAS 062 03 W to Terrestrial Vascular Plants: Vegetative Vigor

PMRA Submission Number {.....} EPA MRID Number 467152-20

Table 1. Summary of most sensitive parameters by species (lbs ai/A).

Species	Endpoint	NOAEC	EC_{05}	EC_{25}	EC_{50}
Cabbage	Plant Height	3.4	2.2	>3.4	>3.4
Carrot	Fresh Weight	0.21	<0.21	2.0	>3.4
Pea	Fresh Weight	0.21	<0.21	>3.4	>3.4
Sunflower	Fresh Weight	<0.21	<0.21	1.5	>3.4
Oat	Fresh Weight	3.4	Not Determined	>3.4	>3.4
Onion	None	3.4	>3.4	>3.4	>3.4

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: The study was conducted following the guidelines outline in the OECD proposal for updated guideline 208, draft document (2000). The following deviations were noted:

Deviations

1. The maximum label rate of the test material was not reported.
2. Only 6 species were tested instead of the recommended 10.
3. The physical/chemical properties of the test material were not reported.
4. Prior treatment, historical % germination and storage of the test seeds were not reported.
5. The LOQ and LOD were not reported; the size and material of the test pots were not reported.
6. The geographic location, depth of collection, CEC and moisture (%) at 1/3 atm of the test soil were not reported.
7. The source of the water used was not reported.
8. Light intensity and quality were not reported.
9. Fresh weight was measured, as opposed to the preferred dry weight measurement. Fresh weight measurements are generally less reliable because of variations in tissue water content.
10. A NOAEC and EC_{05} were unable to be determined for carrot plant height and sunflower fresh weight; inhibitions at the lowest treatment levels were 12 and 17%, respectively.

These deviations did not affect the scientific validity of the study.

COMPLIANCE: This study was conducted according to U.S. EPA GLP Standards, 40 CFR, Part 160, Federal Register; OECD Principles of GLP [C(97)186(Final)] and the German GLP regulations (Chemikaliengesetz, Anhang 1 vom 25 Juli 1994). Signed and dated GLP, No Data Confidentiality and Quality Assurance statements were provided.

A. MATERIALS:

1. Test Material BAS 062 03 W (formulation containing the active ingredient chlormequat chloride)

Description: Liquid

Lot No./Batch No. : 99-2 (Lot No)

Purity: 750 g/l (nominal); 765.8 g/l (measured)

Stability of compound under test conditions: Analysis of the test material yielded a recovery of 102% of nominal) *(OECD recommends chemical stability in water and light)*

Storage conditions of test chemicals: 14-24°C, dry, dark

Table 2. Physical/chemical properties of BAS 0620 03 W.

Parameter	Values	Comments
Water solubility at 20EC	Not reported	
Vapor pressure	Not reported	
UV absorption	Not reported	
pKa	Not reported	
Kow	Not reported	

2. Test organism:

Monocotyledonous species: Oat (Family *Poaceae, Avena sativa*, Flemingstern) and Onion (Family *Liliaceae, Allium cepa*, Frühlingszwiebel); *EPA recommends four monocots in two families, including corn.*
Dicotyledonous species: Cabbage (Family *Brassicaceae, Brassica oleraceae*, Grüner Krauser), Carrot (Family *Umbelliferae, Daucus carota*, Nantaise 2), Pea (Family *Leguminosae, Pisum sativum*, Arvika) and Sunflower (Family *Compositae, Helianthus annus*, Iregi); *EPA recommends six dicots in four families, including soybean and a root crop.*

OECD recommends a minimum of three species selected for testing, at least one from each of the following categories: Category 1: ryegrass, rice, oat, wheat, and sorghum; Category 2: mustard, rape, radish, turnip, and Chinese cabbage; Category 3: vetch, mung bean, red clover, fenugreek, lettuce, and cress.

Seed source: Cabbage, Carrot and Onion-Samenhaus Hoffmann-Benner, Ottersheim; Sunflower and Oat-Feldsaaten Freudenberger GmbH & Co. KG, Krefeld-Bockum; and Pea-Vereinigte Landwarenkaufleute Südwest, AG, Sembach
Prior seed treatment/sterilization: Not reported
Historical % germination of seed: Not reported
Seed storage, if any: Not reported

B. STUDY DESIGN:

1. Experimental Conditions

a. Limit test: A limit test was not reported.

b. Range-finding study: A range-finding study was not reported.

c. Definitive Study

Table 3: Experimental Parameters - Vegetative Vigor

Parameters	Vegetative Vigor	
	Details	Remarks *Criteria*
Duration of the test	21 Days	*Recommended test duration is 14-21 days.*
Number of seeds/plants replicate	Cabbage and Pea- 3 Carrot and Oat- 4 Sunflower- 2 Onion- 5	*Five plants per replicate are recommended.*
Number of plants retained after thinning	No thinning was reported.	
Number of replicates Control: Adjuvant control: Treated: Control: Adjuvant control: Treated:	Cabbage, Carrot, Pea, Oat and Onion: 6 N/A 6 Sunflower: 9 N/A 9	An adjuvant control was not used. *Four replicates per dose are recommended*
Test concentrations (mg ai/kg soil and g ai/ha) Nominal: Measured:	 0 (negative control), 0.21, 0.41, 0.83, 1.7 and 3.3 lbs ai/A 0 (negative control), 0.21, 0.42, 0.84, 1.7 and 3.4 lbs ai/A	 *Five test concentrations should be used with a dose range of 2X or 3X progression*
Method and interval of analytical verification LOQ: LOD:	Samples analyzed on day of application using CIPAC ion chromatography. Not reported Not reported	
Adjuvant (type, percentage, if used)	N/A; an adjuvant was not used.	
Test container (pot)		

Parameters	Vegetative Vigor	
	Details	Remarks *Criteria*
Size/Volume Material: (glass/polystyrene)	Not reported Not reported	*Non-porous containers should be used.* *OECD recommends that non-porous plastic or glazed pots be used.*
Growth facility	On-site greenhouse	
Method/depth of seeding	Cabbage, Carrot, Oat and Onion-0.5 cm Pea and Sunflower- 1.0 cm	
Test material application Application time including the plant growth stage Number of application Application interval Method of application	Application was conducted at test initiation. All plants were at the 2-4 true leaf stage. 1 N/A; only 1 application Laboratory spray booth	
Details of soil used Geographic location Depth of soil collection Soil texture % sand % silt % clay pH: Geographic location Depth of soil collection Soil texture % sand % silt % clay pH: PS1-2001 (Mixture of MU2 and B1-2000) % organic carbon CEC Moisture at 1/3 atm (%)	 Not reported Not reported Loamy sand (MU2- No. 24986) 39.7 49.4 10.9 7.7 Not reported Not reported Loamy sand (B1-2000- No. 30214) 70.5 19.3 10.2 7.4 1.1 Not reported Not reported	The growth medium (PS1-2001) was a mixture of natural soil (MU2; steam sterilized), natural topsoil (B1-2000, steam sterilized) and quartz sand mixed to a ratio of 1:1:05 (v:v:v). *EPA prefers soil mixes containing sandy loam, loam, or clay loam soil with no greater than 2% organic matter. Glass beads, rock wool, and 100% acid washed sand are not preferred..* *OECD prefers the soil to be sieved (0.5 cm) to remove coarse fragments. Carbon content should not exceed 1.5% (3% organic matter). Fine particles (under 20um) makeup should be between 10 and 20%. The recommended pH is between 5.0 and 7.5.*

Data Evaluation Report on the Acute Toxicity of BAS 062 03 W to Terrestrial Vascular Plants: Vegetative Vigor

PMRA Submission Number {.....} EPA MRID Number 467152-20

Parameters	Vegetative Vigor	
	Details	Remarks *Criteria*
Details of nutrient medium, if used	N/A	
Watering regime and schedules Water source/type: Volume applied: Interval of application: Method of application:	 Not reported Based on consumption of each species Approx. once a week Bottom watering	*EPA prefers that under foliage watering or bottom watering be utilized for vegetative vigor studies so that the chemical is not washed out of the soil during the test.*
Any pest control method/fertilization, if used	Flory 9 fertilizer was applied approx once/week with water (1 g/L).	Fertilizer contained: 15% N, 7% P_2O_5, 22% K_2O, 6% MgO, 0.030% B, 0.002% Cu, 0.120 % Fe, 0.050% Mn, 0.005% Mo and 0.010% Zn
Test conditions Temperature: Photoperiod: Light intensity and quality: Relative humidity:	 17.3-24.9°C 16L:8D Not reported 19.5-81.7%	Additional light was provided when daylight was less than 5 klx. *EPA prefers that the cold vs warm loving plants be tested in two separate groups to optimize plant growth.* *OECD prefers that the temperature, humidity and light conditions be suitable for maintaining normal growth of each species for the test period.*
Reference chemical (if used) Name: Concentrations:	 N/A N/A	A reference chemical was not used.
Other parameters, if any	None	

2. Observations:

Table 4: Observation Parameters - Vegetative Vigor

Parameters	Vegetative Vigor	
	Details	Remarks
Parameters measured (i.e., plant height, dry weight or other endpoints)	Plant height, fresh weight and phytotoxicity	
Measurement technique for each parameter	Plant height was determined by clipping the surviving plants at the soil surface and measuring from the base of the stem to the longest leaf. Fresh weight was determined within 15 minutes of clipping. Phytotoxicity was determined by visual assessment using a rating scale based on percentage affected relative to the control. The value for each plant within each replicate was summed without respect to the observed symptom and compared to the control.	
Observation intervals	Phytoxocity was assessed on Days 7, 14 and 21. Plant height and fresh weight were determined at test termination.	
Other observations, if any	None	
Were raw data included?	Yes	
Phytotoxicity rating system, if used	The rating scale was as follows: 0% (no damage), 5%, 10%, 30%, 50%, 70%, 90%, 95% and 100% (plant death).	

II. RESULTS and DISCUSSION:

A. INHIBITORY EFFECTS:

Vegetative Vigor:

Sunflower and carrot were the only two species exhibiting 25% reductions in growth relative to their respective controls. Fresh weight was reduced >25% for sunflower and both growth parameters (plant height and fresh weight) were reduced >25% for carrot. Cabbage and pea did not exhibit significant reductions for either of the growth parameters at any treatment level. The most sensitive dicot was carrot, based on fresh weight, with a NOAEC value of 0.21 lbs ai/A. The EC_{25} value could not be determined, but was reported to be 0.83 lbs ai/A $<EC_{25}$ <3.3 lbs ai/A. Neither of the monocots exhibited significant reductions in growth at any treatment level.

Cabbage, carrot, pea, oat and onion did not exhibit any phytotoxic effects. By Day 21, sunflower exhibited chlorosis and leaf deformation in the 0.41 and 1.7 lbs ai/A treatment groups and exhibited chlorosis, leaf deformation and scorch in the 0.83 and 3.3 lbs ai/A treatment groups. Severity was minimal in all affected plants (5-15%) and incidence increased with application rate. No effects were observed in the negative control or the 0.21 lbs ai/A treatment group.

B. REPORTED STATISTICS:

The reviewer had no objections to the study author's statistical analyses. A copy of the reported analysis methodology (from page 15/47) is appended to this DER.

Table 5: Reported effect of BAS 0620 03 W on Vegetative Vigor

Species	Results summary for biomass (lbs ai/A)									
	Fresh weight (g)*	NOAEC	EC_{05}	95%CI	EC_{25}	95%CI	EC_{50}	95%CI	slope	std err
Cabbage	2.17-6.65	3.3	NR	NR	>3.3	N/A	>3.3	N/A	NR	NR
Carrot	1.22-4.35	0.21	NR	NR	$0.83<EC_{25}<3.3$	NR	>3.3	N/A	NR	NR
Pea	6.54-17.87	3.3	NR	NR	>3.3	N/A	>3.3	N/A	NR	NR
Sunflower	16.15-36.07	<0.21	NR	NR	$0.83<EC_{25}<3.3$	NR	>3.3	N/A	NR	NR
Oat	5.52-9.02	3.3	NR	NR	>3.3	N/A	>3.3	N/A	NR	NR
Onion	0.94-1.94	3.3	NR	NR	>3.3	N/A	>3.3	N/A	NR	NR

* range provided represents the range of the individual seedlings
N/A- Not applicable
NR- Not reported

Table 5a: Reported effect of BAS 0620 03 W on Vegetative Vigor

Species	Results summary for height (lbs ai/A)									
	Height (cm)*	NOAEC	EC_{05}	95%CI	EC_{25}	95%CI	EC_{50}	95%CI	slope	std err
Cabbage	12.2-23.7	3.3	NR	NR	>3.3	N/A	>3.3	N/A	NR	NR
Carrot	21.6-37.6	<0.21	NR	NR	$0.83<EC_{25}<3.3$	NR	>3.3	N/A	NR	NR
Pea	99.7-133.2	3.3	NR	NR	>3.3	N/A	>3.3	N/A	NR	NR
Sunflower	66.8-91.0	0.21	NR	NR	>3.3	N/A	>3.3	N/A	NR	NR
Oat	66.0-79.8	3.3	>3.3	N/A	>3.3	N/A	>3.3	N/A	NR	NR
Onion	29.8-41.0	3.3	>3.3	N/A	>3.3	N/A	>3.3	N/A	NR	NR

* range provided represents the range of the individual seedlings
N/A- Not applicable
NR- Not reported

Plant Injury Index*							
Control	Cabbage	Carrot	Pea	Sunflower	Oat	Onion	Adjuvant control
0	0	0	0	0-15	0	0	N/A

0% (no damage), 5%, 10%, 30%, 50%, 70%, 90%, 95% and 100% (plant death).

C. VERIFICATION OF STATISTICAL RESULTS BY THE REVIEWER:

Any species exhibiting a ≥5% reduction in plant height or fresh weight when compared to the negative control was statistically analyzed for significance. All analyzed data were tested for normality and homogeneity and if these assumptions of ANOVA were met, the NOAEC values were determined using Dunnett's Test or Bonferroni's Test and William's Test (parametric) or Kruskal-Wallis Test (non-parametric) via Toxstat Statistical Software. The ECx values (with 95% C.I.) and dose-response slopes were determined using Nuthatch Statistical Software. The EC_{05}, EC_{25} and EC_{50} values were determined visually when the % reduction, when compared to the control, was <5%, <25% or <50%, respectively. All analyses were conducted using the mean-measured application rates. Phytotoxicity was not statistically analyzed as this endpoint is a qualitative value.

Table 6: Reported effect of BAS 062 03 W on Vegetative Vigor

Species	Results summary for biomass (lbs ai/A)									
	Fresh Weight (g)*	NOAEC	EC_{05}	95%CI	EC_{25}	95%CI	EC_{50}	95%CI	slope	std err
Cabbage	2.17-6.65	3.4	ND	ND	>3.4	N/A	>3.4	N/A	N/A	N/A
Carrot	1.22-4.35	0.21	<0.21	N/A	2.0	0.12-32	>3.4	N/A	0.353	0.255
Pea	6.54-17.87	0.21	<0.21	N/A	>3.4	N/A	>3.4	N/A	0.249	0.500
Sunflower	16.15-36.07	<0.21	<0.21	N/A	1.5	0.20-11	>3.4	N/A	0.243	0.120
Oat	5.52-9.02	3.4	ND	ND	>3.4	N/A	>3.4	ND	ND	ND
Onion	0.94-1.94	3.4	>3.4	N/A	>3.4	N/A	>3.4	N/A	N/A	N/A

* range provided represents the range of the individual seedlings
N/A- Not applicable
ND- Not determined

Table 6a: Reported effect of BAS 062 03 W on Vegetative Vigor

Species	Results summary for plant length (lbs ai/A)									
	Plant Height (cm)*	NOAEC	EC_{05}	95%CI	EC_{25}	95%CI	EC_{50}	95%CI	slope	std err
Cabbage	12.2-23.7	3.4	2.2	0.14-34	>3.4	N/A	>3.4	N/A	1.01	1.90
Carrot	21.6-37.6	<0.21	<0.21	N/A	2.9	0.77-11	>3.4	N/A	0.394	0.139
Pea	99.7-133.2	3.4	2.1	0.026-1.7E^{+02}	>3.4	N/A	>3.4	N/A	0.414	0.579
Sunflower	66.8-91.0	0.21	0.42	0.15-1.2	>3.4	N/A	>3.4	N/A	0.727	0.159
Oat	66.0-79.8	3.4	>3.4	N/A	>3.4	N/A	>3.4	N/A	N/A	N/A
Onion	29.8-41.0	3.4	>3.4	N/A	>3.4	N/A	>3.4	N/A	N/A	N/A

* range provided represents the range of the individual seedlings
N/A- Not applicable
ND- Not determined

Plant Injury Index*							
Control	Cabbage	Carrot	Pea	Sunflower	Oat	Onion	Adjuvant control
0	0	0	0	0-15	0	0	N/A

0% (no damage), 5%, 10%, 30%, 50%, 70%, 90%, 95% and 100% (plant death).

Monocot

EC_{05}/IC_{05}: >3.4 lbs ai/A 95% C.I.: N/A
EC_{25}/IC_{25}: >3.4 lbs ai/A 95% C.I.: N/A
EC_{50}/IC_{50}: >3.4 lbs ai/A 95% C.I.: N/A
NOAEC: 3.4 lbs ai/A
Slope: N/A
Std err: N/A
Most sensitive monocot: None
Most sensitive parameter: N/A

Dicot

EC_{05}/IC_{05}: 0.00015 lbs ai/A 95% C.I.: 0.000000013—1.7
EC_{25}/IC_{25}: 1.5 lbs ai/A 95% C.I.: 0.20-11 lbs ai/A
EC_{50}/IC_{50}: >3.4 lbs ai/A 95% C.I.: N/A
NOAEC: <0.21 lbs ai/A
Slope: 0.243
Std err: 0.120
Most sensitive dicot: Sunflower
Most sensitive parameter: Fresh Weight

D. STUDY DEFICIENCIES:

A NOAEC and EC_{05} could not be determined for the most sensitive species, sunflower. Inhibition in fresh weight at the lowest treatment level was 17%. In this study, the EC_{10} for sunflower fresh weight was <0.21 lbs ai/A; the lowest test level was 0.21 lbs ai/A and the EC_{25} was 1.5 lbs ai/A.

Additionally, A NOAEC and EC_{05} could not be determined for carrot plant height (the reduction at the lowest treatment level was 12%) and fewer species were tested than required for a Tier II vegetative vigor study.

E. REVIEWER'S COMMENTS:

The reviewer's toxicity values are reported in the Executive Summary and Conclusions sections of this DER because they are based on measured application rates and provide EC_{05} values and slopes when appropriate.

In the analyses for plant height, the reviewer was unable to determine a reliable NOAEC or EC_{05} value for carrot due to the observed ≥10% reduction relative to the control at all treatment levels. In the analyses for fresh weight, the reviewer was unable to determine a reliable NOAEC or EC_{05} value for sunflower due to the observed ≥17% reduction relative to the control at all treatment levels. The reviewer suggests that carrot and sunflower be re-tested at lower application rates in order to obtain these toxicity values which are required for risk assessment purposes.

The endpoint for biomass was fresh weight as opposed to the recommended dry weight. Fresh weight is not a good indicator of growth, as different species possess different capacities for holding water and tissue water content can vary depending on experimental conditions.

The nominal purity of the test material was 750 g/L; however, the analyzed purity was reported to 765.8 g/L, which is the value the reviewer used to determine the measured application rates.

In the raw data tables for pea, the study authors report the one plant in the control, two plants in the measured 0.84 lbs ai/A treatment group and one plant in the measured 3.4 lbs ai/A treatment group had no treatment related damages, and therefore, were discarded. No other explanation was provided.

The in-life portion of the definitive vegetative vigor test was conducted from February 21 to March 15, 2001.

Exposure to post-emergent application of BAS 062 03 W (formulation containing the active ingredient chlormequat chloride) caused some reduction in growth to dicots; no monocots were affected by the test material. No mortality occurred and only minimal phytotoxic effects were observed.

F. CONCLUSIONS:

The study is classified as supplementary. The most sensitive dicot was sunflower, based on fresh weight, with a NOAEC (and EC_{05}) and EC_{25} of <0.21 and 1.5 lbs ai/A, respectively. Neither of the two monocot species (oat and onion) exhibited significant reductions at any treatment level for any of the observed endpoints.

Most sensitive monocot and EC_{25}: None, >3.4 lbs ai/A
Most sensitive dicot and EC_{25}: Sunflower (Fresh Weight), 2.0 lbs ai/A

III. REFERENCES:

OECD Guideline for the Testing of Chemicals: Proposal for Updated Guideline 208: Terrestrial (Non-Target) Plant Test: 208 A: Seedling Emergence and Seedling Growth Test; 208 B: Vegetative Vigor Test. Draft Document July 2000.

Sachs, L., Angewandte Statistik, Springer Verlag, 1992.

Christens and Nyholm. 1984. Ecotoxicological assays with algae: Weibull dose-response curves. Environ Sci Technol 18, pp 713-718.

Litchfield, J.T. and F. Wilcoxon. 1949. A simplified method of evaluating dose-effect experiments. J Pharmacol exp Ther 96: pp 99-113.

APPENDIX I. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION:

Cabbage mean fresh weight (g), lbs ai/A; Day 21
File: 5220bw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	5.925	1.185	1.092
Within (Error)	30	32.539	1.085	
Total	35	38.464		

Critical F value = 2.53 (0.05,5,30)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Cabbage mean fresh weight (g), lbs ai/A; Day 21
File: 5220bw Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	neg control	4.498	4.498		
2	0.21	4.615	4.615	-0.194	
3	0.42	5.428	5.428	-1.546	
4	0.84	4.997	4.997	-0.829	
5	1.7	4.143	4.143	0.590	
6	3.7	4.590	4.590	-0.152	

Dunnett table value = 2.33 (1 Tailed Value, P=0.05, df=30,5)

Cabbage mean fresh weight (g), lbs ai/A; Day 21
File: 5220bw Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	neg control	6			
2	0.21	6	1.401	31.2	-0.117
3	0.42	6	1.401	31.2	-0.930
4	0.84	6	1.401	31.2	-0.498
5	1.7	6	1.401	31.2	0.355
6	3.7	6	1.401	31.2	-0.092

Cabbage mean fresh weight (g), lbs ai/A; Day 21
File: 5220bw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	4.498	4.498	4.498
2	0.21	6	4.615	4.615	4.615
3	0.42	6	5.428	5.428	4.790
4	0.84	6	4.997	4.997	4.790
5	1.7	6	4.143	4.143	4.790
6	3.7	6	4.590	4.590	4.790

Cabbage mean fresh weight (g), lbs ai/A; Day 21
File: 5220bw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
neg control	4.498				
0.21	4.615	0.194		1.70	k= 1, v=30
0.42	4.790	0.484		1.78	k= 2, v=30
0.84	4.790	0.484		1.80	k= 3, v=30
1.7	4.790	0.484		1.81	k= 4, v=30
3.7	4.790	0.484		1.82	k= 5, v=30

s = 1.041
Note: df used for table values are approximate when v > 20.

Cabbage mean plant height (cm), lbs ai/A; Day 21
File: 5220bh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	35.396	7.079	1.259
Within (Error)	30	168.633	5.621	
Total	35	204.029		

Critical F value = 2.53 (0.05,5,30)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Cabbage mean plant height (cm), lbs ai/A; Day 21
File: 5220bh Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	neg control	18.800	18.800		
2	0.21	17.833	17.833	0.706	
3	0.42	20.450	20.450	-1.205	
4	0.84	18.317	18.317	0.353	

5	1.7	17.483	17.483	0.962
6	3.4	17.783	17.783	0.743

Dunnett table value = 2.33 (1 Tailed Value, P=0.05, df=30,5)

Cabbage mean plant height (cm), lbs ai/A; Day 21
File: 5220bh Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	neg control	6			
2	0.21	6	3.189	17.0	0.967
3	0.42	6	3.189	17.0	-1.650
4	0.84	6	3.189	17.0	0.483
5	1.7	6	3.189	17.0	1.317
6	3.4	6	3.189	17.0	1.017

Cabbage mean plant height (cm), lbs ai/A; Day 21
File: 5220bh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	18.800	18.800	19.028
2	0.21	6	17.833	17.833	19.028
3	0.42	6	20.450	20.450	19.028
4	0.84	6	18.317	18.317	18.317
5	1.7	6	17.483	17.483	17.633
6	3.4	6	17.783	17.783	17.633

Cabbage mean plant height (cm), lbs ai/A; Day 21
File: 5220bh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
neg control	19.028				
0.21	19.028	0.166		1.70	k= 1, v=30
0.42	19.028	0.166		1.78	k= 2, v=30
0.84	18.317	0.353		1.80	k= 3, v=30
1.7	17.633	0.852		1.81	k= 4, v=30
3.4	17.633	0.852		1.82	k= 5, v=30

s = 2.371
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC5	2.2	0.14	34.	0.58	0.066
EC10	5.0	0.47	54.	0.51	0.093
EC25	20.	0.022	1.9E+04	1.5	0.0011
EC50	92.	0.00034	2.5E+07	2.7	3.7E-06

Slope = 1.01 Std.Err. = 1.90

Goodness of fit: p = 0.22 based on DF= 3.0 30.

5220BH : Cabbage mean plant height (cm), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	18.8	18.9	-0.0977	100.	0.00
0.210	6.00	17.8	18.8	-0.995	99.6	0.368
0.420	6.00	20.4	18.7	1.72	99.1	0.877
0.840	6.00	18.3	18.5	-0.218	98.1	1.92
1.70	6.00	17.5	18.2	-0.672	96.1	3.93
3.40	6.00	17.8	17.5	0.264	92.7	7.30

!!!Warning: EC10 not bracketed by doses evaluated.

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Carrot mean fresh weight (g), lbs ai/A; Day 21
File: 5220cw Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	9.385	1.877	7.219
Within (Error)	30	7.811	0.260	
Total	35	17.196		

Critical F value = 2.53 (0.05,5,30)
Since F > Critical F REJECT Ho:All groups equal

Carrot mean fresh weight (g), lbs ai/A; Day 21
File: 5220cw Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	neg control	3.910	3.910		
2	0.21	3.523	3.523	1.313	
3	0.42	3.058	3.058	2.893	*

4	0.84	3.410	3.410	1.698
5	1.7	2.253	2.253	5.627 *
6	3.4	3.230	3.230	2.310

Dunnett table value = 2.33 (1 Tailed Value, P=0.05, df=30,5)

Carrot mean fresh weight (g), lbs ai/A; Day 21
File: 5220cw Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	neg control	6			
2	0.21	6	0.686	17.5	0.387
3	0.42	6	0.686	17.5	0.852
4	0.84	6	0.686	17.5	0.500
5	1.7	6	0.686	17.5	1.657
6	3.4	6	0.686	17.5	0.680

Carrot mean fresh weight (g), lbs ai/A; Day 21
File: 5220cw Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	3.910	3.910	3.910
2	0.21	6	3.523	3.523	3.523
3	0.42	6	3.058	3.058	3.234
4	0.84	6	3.410	3.410	3.234
5	1.7	6	2.253	2.253	2.742
6	3.4	6	3.230	3.230	2.742

Carrot mean fresh weight (g), lbs ai/A; Day 21
File: 5220cw Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
neg control	3.910				
0.21	3.523	1.313		1.70	k= 1, v=30
0.42	3.234	2.294	*	1.78	k= 2, v=30
0.84	3.234	2.294	*	1.80	k= 3, v=30
1.7	2.742	3.966	*	1.81	k= 4, v=30
3.4	2.742	3.966	*	1.82	k= 5, v=30

s = 0.510
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.0036	2.2E-07	57.	2.1	6.3E-05
EC10	0.038	6.2E-05	24.	1.4	0.0016
EC25	2.0	0.12	32.	0.59	0.062
EC50	1.6E+02	0.14	1.8E+05	1.5	0.00089

Slope = 0.353 Std.Err. = 0.255

!!!Poor fit: p = 0.0013 based on DF= 3.0 30.

5220CW : Carrot mean fresh weight (g), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	3.91	3.93	-0.0170	100.	0.00
0.210	6.00	3.52	3.32	0.201	84.6	15.4
0.420	6.00	3.06	3.22	-0.160	81.9	18.1
0.840	6.00	3.41	3.10	0.307	79.0	21.0
1.70	6.00	2.25	2.98	-0.722	75.8	24.2
3.40	6.00	3.23	2.84	0.390	72.3	27.7

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC10 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Carrot mean plant height (cm), lbs ai/A; Day 21
File: 5220ch Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	396.086	79.217	13.682
Within (Error)	30	173.697	5.790	
Total	35	569.782		

Critical F value = 2.53 (0.05,5,30)
Since F > Critical F REJECT Ho:All groups equal

Carrot mean plant height (cm), lbs ai/A; Day 21
File: 5220ch Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	neg control	35.417	35.417		
2	0.21	31.250	31.250	2.999	*

3	0.42	29.583	29.583	4.199	*
4	0.84	30.383	30.383	3.623	*
5	1.7	24.517	24.517	7.846	*
6	3.4	27.783	27.783	5.495	*

Dunnett table value = 2.33 (1 Tailed Value, P=0.05, df=30,5)

Carrot mean plant height (cm), lbs ai/A; Day 21
File: 5220ch Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	neg control	6			
2	0.21	6	3.237	9.1	4.167
3	0.42	6	3.237	9.1	5.833
4	0.84	6	3.237	9.1	5.033
5	1.7	6	3.237	9.1	10.900
6	3.4	6	3.237	9.1	7.633

Carrot mean plant height (cm), lbs ai/A; Day 21
File: 5220ch Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	35.417	35.417	35.417
2	0.21	6	31.250	31.250	31.250
3	0.42	6	29.583	29.583	29.983
4	0.84	6	30.383	30.383	29.983
5	1.7	6	24.517	24.517	26.150
6	3.4	6	27.783	27.783	26.150

Carrot mean plant height (cm), lbs ai/A; Day 21
File: 5220ch Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
neg control	35.417				
0.21	31.250	2.999	*	1.70	k= 1, v=30
0.42	29.983	3.911	*	1.78	k= 2, v=30
0.84	29.983	3.911	*	1.80	k= 3, v=30
1.7	26.150	6.670	*	1.81	k= 4, v=30
3.4	26.150	6.670	*	1.82	k= 5, v=30

s = 2.406
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.0099	0.00016	0.60	0.88	0.017
EC10	0.083	0.0056	1.2	0.58	0.067
EC25	2.9	0.77	11.	0.28	0.27
EC50	1.5E+02	5.6	4.0E+03	0.70	0.037

Slope = 0.394 Std.Err. = 0.139

!!!Poor fit: p = 0.0049 based on DF= 3.0 30.

5220CH : Carrot mean plant height (cm), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	35.4	35.5	-0.0667	100.	0.00
0.210	6.00	31.3	30.8	0.406	86.9	13.1
0.420	6.00	29.6	29.9	-0.308	84.2	15.8
0.840	6.00	30.4	28.8	1.57	81.2	18.8
1.70	6.00	24.5	27.6	-3.09	77.8	22.2
3.40	6.00	27.8	26.3	1.49	74.1	25.9

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC10 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Pea mean fresh weight (g), lbs ai/A; Day 21
File: 5220pw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	30.262	6.052	0.710
Within (Error)	26	221.745	8.529	
Total	31	252.007		

Critical F value = 2.59 (0.05,5,26)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Pea mean fresh weight (g), lbs ai/A; Day 21
File: 5220pw Transform: NO TRANSFORMATION

BONFERRONI T-TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	neg control	13.186	13.186		

2	0.21	11.332	11.332	1.049
3	0.42	12.528	12.528	0.372
4	0.84	10.503	10.503	1.370
5	1.7	12.212	12.212	0.551
6	3.4	10.502	10.502	1.453

Bonferroni T table value = 2.48 (1 Tailed Value, P=0.05, df=26,5)

Pea mean fresh weight (g), lbs ai/A; Day 21
File: 5220pw Transform: NO TRANSFORMATION

BONFERRONI T-TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	neg control	5			
2	0.21	6	4.384	33.2	1.854
3	0.42	6	4.384	33.2	0.658
4	0.84	4	4.857	36.8	2.683
5	1.7	6	4.384	33.2	0.974
6	3.4	5	4.579	34.7	2.684

Pea mean fresh weight (g), lbs ai/A; Day 21
File: 5220pw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	5	13.186	13.186	13.186
2	0.21	6	11.332	11.332	11.930
3	0.42	6	12.528	12.528	11.930
4	0.84	4	10.503	10.503	11.528
5	1.7	6	12.212	12.212	11.528
6	3.4	5	10.502	10.502	10.502

Pea mean fresh weight (g), lbs ai/A; Day 21
File: 5220pw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
neg control	13.186				
0.21	11.930	0.710		1.71	k= 1, v=26
0.42	11.930	0.710		1.79	k= 2, v=26
0.84	11.528	0.846		1.81	k= 3, v=26
1.7	11.528	0.938		1.82	k= 4, v=26
3.4	10.502	1.453		1.83	k= 5, v=26

s = 2.920
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.0090	4.4E-13	1.8E+08	5.0	4.9E-11
EC10	0.26	1.5E-06	4.4E+04	2.6	5.9E-06
EC25	70.	2.7E-06	1.8E+09	3.6	3.8E-08
EC50	3.5E+04	4.7E-14	2.7E+22	8.7	1.3E-18

Slope = 0.249 Std.Err. = 0.500

Goodness of fit: p = 0.59 based on DF= 3.0 26.

5220PW : Pea mean fresh weight (g), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	5.00	13.2	13.2	0.0228	100.	0.00
0.210	6.00	11.3	11.9	-0.565	90.4	9.62
0.420	6.00	12.5	11.7	0.808	89.0	11.0
0.840	4.00	10.5	11.5	-1.02	87.6	12.4
1.70	6.00	12.2	11.3	0.901	85.9	14.1
3.40	5.00	10.5	11.1	-0.579	84.2	15.8

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Pea mean plant height (cm), lbs ai/A; Day 21
File: 5220ph Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	365.396	73.079	0.792
Within (Error)	26	2399.504	92.289	
Total	31	2764.900		

Critical F value = 2.59 (0.05,5,26)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Pea mean plant height (cm), lbs ai/A; Day 21
File: 5220ph Transform: NO TRANSFORMATION

BONFERRONI T-TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG

1	neg control	121.860	121.860	
2	0.21	116.467	116.467	0.927
3	0.42	121.683	121.683	0.030
4	0.84	113.850	113.850	1.243
5	1.7	118.283	118.283	0.615
6	3.4	112.940	112.940	1.468

Bonferroni T table value = 2.48 (1 Tailed Value, P=0.05, df=26,5)

Pea mean plant height (cm), lbs ai/A; Day 21
File: 5220ph Transform: NO TRANSFORMATION

BONFERRONI T-TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	neg control	5			
2	0.21	6	14.421	11.8	5.393
3	0.42	6	14.421	11.8	0.177
4	0.84	4	15.976	13.1	8.010
5	1.7	6	14.421	11.8	3.577
6	3.4	5	15.062	12.4	8.920

Pea mean plant height (cm), lbs ai/A; Day 21
File: 5220ph Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	5	121.860	121.860	121.860
2	0.21	6	116.467	116.467	119.075
3	0.42	6	121.683	121.683	119.075
4	0.84	4	113.850	113.850	116.510
5	1.7	6	118.283	118.283	116.510
6	3.4	5	112.940	112.940	112.940

Pea mean plant height (cm), lbs ai/A; Day 21
File: 5220ph Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
neg control	121.860				
0.21	119.075	0.479		1.71	k= 1, v=26
0.42	119.075	0.479		1.79	k= 2, v=26
0.84	116.510	0.830		1.81	k= 3, v=26
1.7	116.510	0.920		1.82	k= 4, v=26
3.4	112.940	1.468		1.83	k= 5, v=26

s = 9.607

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	2.1	0.026	1.7E+02	0.93	0.012
EC10	16.	0.042	6.1E+03	1.3	0.0026
EC25	4.7E+02	0.00023	9.6E+08	3.1	4.9E-07
EC50	2.0E+04	2.8E-07	1.4E+15	5.3	1.4E-11

Slope = 0.414 Std.Err. = 0.579

Goodness of fit: p = 0.55 based on DF= 3.0 26.

5220PH : Pea mean plant height (cm), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	5.00	122.	122.	0.353	100.	0.00
0.210	6.00	116.	119.	-2.65	98.0	1.97
0.420	6.00	122.	118.	3.39	97.4	2.64
0.840	4.00	114.	117.	-3.40	96.5	3.50
1.70	6.00	118.	116.	2.37	95.4	4.60
3.40	5.00	113.	114.	-1.36	94.1	5.94

!!!Warning: EC10 not bracketed by doses evaluated.

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Sunflower mean fresh weight (g), lbs ai/A; Day 21
File: 5220sw Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	401.520	80.304	8.534
Within (Error)	48	451.674	9.410	
Total	53	853.194		

Critical F value = 2.45 (0.05,5,40)
Since F > Critical F REJECT Ho:All groups equal

Sunflower mean fresh weight (g), lbs ai/A; Day 21
File: 5220sw Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG

1	neg control	28.986	28.986		
2	0.21	24.071	24.071	3.398	*
3	0.42	21.657	21.657	5.068	*
4	0.84	23.003	23.003	4.137	*
5	1.7	21.663	21.663	5.064	*
6	3.4	20.800	20.800	5.661	*

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

Sunflower mean fresh weight (g), lbs ai/A; Day 21
File: 5220sw Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	neg control	9			
2	0.21	9	3.340	11.5	4.914
3	0.42	9	3.340	11.5	7.329
4	0.84	9	3.340	11.5	5.982
5	1.7	9	3.340	11.5	7.322
6	3.4	9	3.340	11.5	8.186

Sunflower mean fresh weight (g), lbs ai/A; Day 21
File: 5220sw Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	9	28.986	28.986	28.986
2	0.21	9	24.071	24.071	24.071
3	0.42	9	21.657	21.657	22.330
4	0.84	9	23.003	23.003	22.330
5	1.7	9	21.663	21.663	21.663
6	3.4	9	20.800	20.800	20.800

Sunflower mean fresh weight (g), lbs ai/A; Day 21
File: 5220sw Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
neg control	28.986				
0.21	24.071	3.399	*	1.68	k= 1, v=48
0.42	22.330	4.603	*	1.76	k= 2, v=48
0.84	22.330	4.603	*	1.79	k= 3, v=48
1.7	21.663	5.064	*	1.80	k= 4, v=48
3.4	20.800	5.661	*	1.80	k= 5, v=48

s = 3.068
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.00015	1.3E-08	1.7	2.0	8.8E-05
EC10	0.0047	1.1E-05	2.0	1.3	0.0023
EC25	1.5	0.20	11.	0.43	0.13
EC50	8.7E+02	1.2	6.3E+05	1.4	0.0014

Slope = 0.243 Std.Err. = 0.120

Goodness of fit: p = 0.49 based on DF= 3.0 48.

5220SW : Sunflower mean fresh weight (g), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	9.00	29.0	29.0	-0.00269	100.	0.00
0.210	9.00	24.1	23.5	0.570	81.1	18.9
0.420	9.00	21.7	22.9	-1.25	79.0	21.0
0.840	9.00	23.0	22.3	0.726	76.9	23.1
1.70	9.00	21.7	21.6	0.0618	74.5	25.5
3.40	9.00	20.8	20.9	-0.103	72.1	27.9

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC10 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Sunflower mean plant height (cm), lbs ai/A; Day 21
File: 5220sh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	1171.274	234.255	14.483
Within (Error)	48	776.384	16.175	
Total	53	1947.659		

Critical F value = 2.45 (0.05,5,40)
Since F > Critical F REJECT Ho:All groups equal

Sunflower mean plant height (cm), lbs ai/A; Day 21
File: 5220sh Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

TRANSFORMED MEAN CALCULATED IN

GROUP	IDENTIFICATION	MEAN	ORIGINAL UNITS	T STAT	SIG
1	neg control	86.722	86.722		
2	0.21	84.022	84.022	1.424	
3	0.42	81.878	81.878	2.555	*
4	0.84	79.767	79.767	3.669	*
5	1.7	77.644	77.644	4.788	*
6	3.4	72.222	72.222	7.648	*

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

Sunflower mean plant height (cm), lbs ai/A; Day 21
File: 5220sh Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	neg control	9			
2	0.21	9	4.380	5.1	2.700
3	0.42	9	4.380	5.1	4.844
4	0.84	9	4.380	5.1	6.956
5	1.7	9	4.380	5.1	9.078
6	3.4	9	4.380	5.1	14.500

Sunflower mean plant height (cm), lbs ai/A; Day 21
File: 5220sh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	9	86.722	86.722	86.722
2	0.21	9	84.022	84.022	84.022
3	0.42	9	81.878	81.878	81.878
4	0.84	9	79.767	79.767	79.767
5	1.7	9	77.644	77.644	77.644
6	3.4	9	72.222	72.222	72.222

Sunflower mean plant height (cm), lbs ai/A; Day 21
File: 5220sh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
neg control	86.722				
0.21	84.022	1.424		1.68	k= 1, v=48
0.42	81.878	2.555	*	1.76	k= 2, v=48
0.84	79.767	3.669	*	1.79	k= 3, v=48
1.7	77.644	4.788	*	1.80	k= 4, v=48
3.4	72.222	7.648	*	1.80	k= 5, v=48

s = 4.022
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.42	0.15	1.2	0.23	0.35
EC10	1.3	0.72	2.5	0.14	0.54
EC25	9.2	5.0	17.	0.13	0.55
EC50	78.	19.	3.2E+02	0.31	0.24

Slope = 0.727 Std.Err. = 0.159

Goodness of fit: p = 0.87 based on DF= 3.0 48.

5220SH : Sunflower mean plant height (cm), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	9.00	86.7	86.6	0.0981	100.	0.00
0.210	9.00	84.0	83.9	0.0812	96.9	3.10
0.420	9.00	81.9	82.3	-0.441	95.0	4.97
0.840	9.00	79.8	80.0	-0.229	92.3	7.65
1.70	9.00	77.6	76.8	0.883	88.6	11.4
3.40	9.00	72.2	72.6	-0.392	83.8	16.2

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Oat mean fresh weight (g), lbs ai/A; Day 21
File: 5220ow Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	3.520	0.704	1.040
Within (Error)	30	20.301	0.677	
Total	35	23.821		

Critical F value = 2.53 (0.05,5,30)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Oat mean fresh weight (g), lbs ai/A; Day 21
File: 5220ow Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG

1	neg control	7.617	7.617		
2	0.21	6.737	6.737	1.852	
3	0.42	7.303	7.303	0.660	
4	0.84	6.932	6.932	1.442	
5	1.7	7.278	7.278	0.712	
6	3.4	7.542	7.542	0.158	

Dunnett table value = 2.33 (1 Tailed Value, P=0.05, df=30,5)

Oat mean fresh weight (g), lbs ai/A; Day 21
File: 5220ow Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	neg control	6			
2	0.21	6	1.107	14.5	0.880
3	0.42	6	1.107	14.5	0.313
4	0.84	6	1.107	14.5	0.685
5	1.7	6	1.107	14.5	0.338
6	3.4	6	1.107	14.5	0.075

Oat mean fresh weight (g), lbs ai/A; Day 21
File: 5220ow Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	7.617	7.617	7.617
2	0.21	6	6.737	6.737	7.158
3	0.42	6	7.303	7.303	7.158
4	0.84	6	6.932	6.932	7.158
5	1.7	6	7.278	7.278	7.158
6	3.4	6	7.542	7.542	7.158

Oat mean fresh weight (g), lbs ai/A; Day 21
File: 5220ow Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
neg control	7.617				
0.21	7.158	0.965		1.70	k= 1, v=30
0.42	7.158	0.965		1.78	k= 2, v=30
0.84	7.158	0.965		1.80	k= 3, v=30
1.7	7.158	0.965		1.81	k= 4, v=30
3.4	7.158	0.965		1.82	k= 5, v=30

s = 0.823
Note: df used for table values are approximate when v > 20.

Onion mean fresh weight (g), lbs ai/A; Day 21
File: 5220nw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.103	0.021	0.292
Within (Error)	30	2.157	0.072	
Total	35	2.260		

Critical F value = 2.53 (0.05,5,30)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Onion mean fresh weight (g), lbs ai/A; Day 21
File: 5220nw Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	neg control	1.535	1.535		
2	0.21	1.590	1.590	-0.355	
3	0.42	1.495	1.495	0.258	
4	0.84	1.590	1.590	-0.355	
5	1.7	1.438	1.438	0.624	
6	3.4	1.512	1.512	0.151	

Dunnett table value = 2.33 (1 Tailed Value, P=0.05, df=30,5)

Onion mean fresh weight (g), lbs ai/A; Day 21
File: 5220nw Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	neg control	6			
2	0.21	6	0.361	23.5	-0.055
3	0.42	6	0.361	23.5	0.040
4	0.84	6	0.361	23.5	-0.055
5	1.7	6	0.361	23.5	0.097
6	3.4	6	0.361	23.5	0.023

Onion mean fresh weight (g), lbs ai/A; Day 21
File: 5220nw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	1.535	1.535	1.563
2	0.21	6	1.590	1.590	1.563
3	0.42	6	1.495	1.495	1.543
4	0.84	6	1.590	1.590	1.543
5	1.7	6	1.438	1.438	1.475
6	3.4	6	1.512	1.512	1.475

Onion mean fresh weight (g), lbs ai/A; Day 21
File: 5220nw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
neg control	1.563				
0.21	1.563	0.178		1.70	k= 1, v=30
0.42	1.543	0.048		1.78	k= 2, v=30
0.84	1.543	0.048		1.80	k= 3, v=30
1.7	1.475	0.388		1.81	k= 4, v=30
3.4	1.475	0.388		1.82	k= 5, v=30

s = 0.268
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	4.3	0.0098	1.9E+03	1.3	0.0023
EC10	14.	7.3E-05	2.8E+06	2.6	5.1E-06
EC25	1.1E+02	1.3E-10	9.0E+13	5.9	1.2E-12
EC50	1.0E+03	2.4E-17	4.2E+22	9.6	2.4E-20

Slope = 0.693 Std.Err. = 2.74

Goodness of fit: p = 0.76 based on DF= 3.0 30.

5220NW : Onion mean fresh weight (g), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	1.54	1.55	-0.0181	100.	0.00
0.210	6.00	1.59	1.54	0.0452	99.5	0.538
0.420	6.00	1.50	1.54	-0.0432	99.0	0.960
0.840	6.00	1.59	1.53	0.0624	98.4	1.65
1.70	6.00	1.44	1.51	-0.0723	97.3	2.74
3.40	6.00	1.51	1.49	0.0260	95.7	4.34

!!!Warning: EC5 not bracketed by doses evaluated.

```
!!!Warning: EC10 not bracketed by doses evaluated.

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.
```